

Undergraduate Thesis Prospectus

Examining Collisions and Rendering in an ECS Architectural Game Engine

(technical research project in Computer Science)

How Corporations Justify Loot Boxes in Video Games

(STS research project)

by

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On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

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General Research Problem: the ethics and effectiveness of game development

How can video games be improved? I will investigate the ethical game design and effective tools of game development.

About 150 million Americans play video games, earning the industry over \$43.4 billion annually (ESA, 2018). The video game industry is controversial. It has been accused of exploiting young consumers, unethical material sources, and poor diversity.

Examining collisions and rendering in an ECS architectural game engine

How can collisions and rendering in a game engine improve? My capstone advisor is Mark Floryan of the Computer Science department. In this capstone project I will be building a video game engine.

A game engine is a software development tool that assists developers who build video games. Game engines are used for developing video games on consoles (i.e. Xbox, PlayStation), personal computers, and mobile devices. I will use the entity-component-system (ECS) architecture. An entity is the object in a game, and consists only of a unique identifier. Components are abilities or descriptions that can be attached to an entity, which define how an entity can interact with the world. Systems run separately in their own thread and define global actions that affect every entity possessing a certain component (Martin, 2007).

My goals are to expand the engine's collision and rendering capability. Collision improvement goals include: varying elasticity of objects, adding more complex shapes (beyond boxes and spheres), and adding compound colliders. For rendering. I will add point/click support, text rendering, and accommodate more lights in a space without performance degradation.

The state of the art regarding game engines are Unreal Engine and Unity, which are open source. Most companies have a proprietary game engine. Modern engines are reaching the limit on VR rendering and adding mobile gaming functionality. I will study collisions and rendering at a fundamental level, and test new techniques.

I will use and combine other APIs to build improved rendering and collisions for the game engine, add logging in the engine to improve performance, and speed up testing. I will use git to build and refer back to prototypes.

At the end of my project I will have a complete ECS architectural game engine that can easily be dissected for teaching and manipulated for research or investigative purposes. Other students may improve the engine further.

How Corporations Justify Loot Boxes in Video Games

How are game companies defending loot boxes in video games against critics who condemn them as a form of gambling?

A “Loot box” is a virtual container of items, modifications, or cosmetics purchased with a real-world or virtual currency. Such a purchase is a microtransaction, an “e-commerce transaction involving a small sum of money.” A loot box, however, conceals the purchased items until the transaction is complete.

Since their origins in 2006, loot boxes have proliferated. In 2008 the popular game *EverQuest* introduced free accounts. A 150 percent increase in account registrations followed (Duverge, 2016). The business model soon spread, reaching free-to-play games like *Farmville*, a Facebook application, generating \$150 million in 2010, and *Clash of Clans*, a mobile game, generating \$2.3 billion in 2016 (Agarwal, 2019).

In the business, “loot boxes” are called “random chance purchases” (RCPs). They tempt players with a “mystery bag of goodies that could potentially be worth much more than the price of admission” (Duverge, 2016). Critics consider RCPs to be gambling, and a gateway to gambling addiction, particularly for children.

Participants include the Entertainment Software Rating Board (ESRB), a self-regulatory body for the video game industry created by the industry. ESRB's mission statement is to help “parents make informed choices about the games their families play” (ESRB, 1994). ESRB promotes a safe experience for children playing video games by assigning video game ratings and content descriptions. ESRB believes loot boxes and gambling are unrelated. ESRB compares loot boxes to “locked treasure chests that contain an array of virtual items that can be used in the game once unlocked” (Vance, 2019). Despite criticisms, ESRB stands by its stance that “a bet is not sufficient to warrant a Simulated Gambling descriptor.” Vance, president of ESRB, acknowledges that loot boxes entice children to spend money in game. She urges parents to take “advantage of parental controls available on every game device” to prevent children from purchasing games with loot boxes. ESRB asserts that parents are responsible for their children's purchases.

A prominent video game critic, Joe Vargas, or “Angry Joe,” is a YouTuber with over 1 billion total views and 3 million subscribers. He opposes loot boxes. He argues that any game with loot boxes should have a “mature rating.” While many critics want to ban loot boxes, Vargas and his followers want the video game industry to refrain from targeting children. Vargas attacked ESRB's decision on a basketball video game (the *NBA 2k* franchise) for its rating of “E” (for all ages), despite having RCPs from which the

company, *Take-Two Interactive*, earns most of its profit (Vargas, 2019). Vargas also accuses companies of applying planned obsolescence, so the value of loot box contents falls quickly, enticing some players back to the game (2019).

Game developers welcome loot boxes as means to support game development. Rami Ismail, a game developer, tweeted “I don’t like loot boxes but nothing has made me like them more than the slow audience realization that game developers do need income” (2017). According to Martin (2017) the industry “should be doing everything in its power to protect workers and end the constant cycle of layoffs and studio closures that drives talent away from the industry. If pay-to-play loot boxes and microtransactions help with that, they might be a necessary evil.”

Some lawmakers want to ban loot boxes. Josh Hawley, U.S. Senator for Missouri has condemned loot boxes (Hawley, 2019), arguing “video games prey on user addiction, siphoning our kids’ attention from the real world and extracting profits from fostering compulsive habits” (Hawley, 2019). The Federal Trade Commission agreed in November 2018 to investigate loot boxes as gambling, and children’s susceptibility to them. The Entertainment Software Association (ESA) condemned Hawley’s proposal as, “flawed and riddled with inaccuracies” (Good, 2019).

Gaming companies are defending loot boxes. The Vice President of Electronic Arts (EA), a major game company has responded to its critics. Kerry Hopkins distinguished video games with RCPs from similar game features: “randomized purchases aren’t loot boxes, but rather surprise mechanics.” She compares loot boxes to other children’s toys, such as Kinder Eggs and Hatchimals (Bailey, 2019). Activision was subtler. It waited months after a game’s release to introduce RCPs. Through an update, A

late introduction of RCPs allows the game to gather good reviews from critics and favorable ratings from ESRB.

Under pressure, some companies, including Activision, have insisted they will reduce the need to open loot boxes to compete in a game. Activision promises to offer a “season pass” to users who pay fixed prices to access content in updates after a game’s release (Activision, 2019). But companies are still finding ways to disguise RCPs. The season pass for *Fallout 76*, for example, contains in-game currency that can only be spent on RCPs.

References

- Activision (2019, Oct. 17). Announcement: Call of Duty: Modern Warfare Post-Launch Approach to New Content. (2019, October 17). <https://blog.activision.com/call-of-duty/2019-10/Announcement-Call-of-Duty-Modern-Warfare-Post-Launch-Approach-to-New-Content>.
- Agarwal, P. (2019, Apr. 10). Economics of Microtransactions in Video Games. <https://www.intelligenteconomist.com/economics-of-microtransactions/>.
- Bailey (2019), Bailey, D. (2019, Sept. 11). EA: They're not loot boxes, they're "surprise mechanics," and they're "quite ethical". <https://www.pcgamesn.com/ea-loot-boxes>.
- Duverge, G. (2016, Feb. 25). Insert More Coins: The Psychology Behind Microtransactions. <https://www.tuw.edu/psychology/psychology-behind-microtransactions/>.
- ESA (2019, May 21). U.S. Video Game Sales Reach Record-Breaking \$43.4 Billion in 2018. [https://www.theesa.com/press-releases/u-s-video-game-sales-reach-record-breaking-43-4-billion-in-2018/#targetText=WASHINGTON–January 22, 2019–, ESA\) and The NPD Group](https://www.theesa.com/press-releases/u-s-video-game-sales-reach-record-breaking-43-4-billion-in-2018/#targetText=WASHINGTON–January 22, 2019–, ESA) and The NPD Group).
- Good, O. S. (2019, May 23). Anti-loot box bill gathers bipartisan support in Senate. <https://www.polygon.com/2019/5/23/18637155/loot-box-laws-us-senate-josh-hawley-ed-markey-richard-blumenthal>.
- Hawley, J. (2019, May 8). Senator Hawley to Introduce Legislation Banning Manipulative Video Game Features Aimed at Children. <https://www.hawley.senate.gov/senator-hawley-introduce-legislation-banning-manipulative-video-game-features-aimed-children>.
- Ismail, R. (2017, Oct. 10). The financial realities & audience expectations just don't match. Something had to give, so I guess loot boxes are a sort of industry SOS. Twitter, https://twitter.com/tha_rami/status/917804923458347008.

- Martin, A. (2007, Nov. 11). machine.org. <http://t-machine.org/index.php/2007/11/11/entity-systems-are-the-future-of-mmog-development-part-2/>.
- Martin, G. (2017, Oct.10). Loot Boxes Are More Proof that the Economics of Videogames Are Broken. <https://www.pastemagazine.com/articles/2017/10/loot-boxes-are-more-proof-that-the-economics-of-vi.html>.
- Nielsen, R. K. L., & Grabarczyk, P. (n.d.). Are Loot Boxes Gambling? Random Reward Mechanisms in Video Games. <http://todigra.org/index.php/todigra/article/view/104/151>.
- Rouse, M. (n.d.). What is loot box? - Definition from WhatIs.com. <https://whatis.techtarget.com/definition/loot-box#targetText=In video games, a loot,and modifications based on chance.&targetText=Loot boxes and other microtransactions,for as an initial purchase>.
- Vargas, J. (2019, Oct.7). The ESRB has responded to our Angry Rant! <https://www.youtube.com/watch?v=bQtVz26y1Ws>.